

**U.S. EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity
Reference Values for Mammals (Revision Date 11/21/2002)**

| Chemical | Low TRV mg/kg- day | High TRV mg/kg- day | Test Species | Toxic Endpoint(s) | Reference |
|--------------------------|-----------------------------|------------------------------|-----------------|---|----------------------------------|
| Aldrin | 0.1 | 1.0 | Rat | Neurobehavioral | Paul <i>et al.</i> , 1992 |
| Arsenic | 0.32 | - | Rat | Growth, cancer, serum chemistries | Schroeder <i>et al.</i> , 1968 |
| | - | 4.7 | Rat | Kidney, pulmonary | Brown <i>et al.</i> , 1976 |
| Benzo(a)pyrene | 1.31 | - | Mouse | Cancer | Neal & Rigdon, 1967 |
| | - | 32.8 | Mouse | Cancer | Neal & Rigdon, 1967 |
| Butyltins | 0.25 | - | Rat | Reproductive | Smialowicz <i>et al.</i> , 1989 |
| | - | 15 | Rat | Reproductive | Ema <i>et al.</i> , 1995 |
| Cadmium | 0.06 | - | Mouse | Reproductive | Webster, 1988 |
| | - | 2.64 | Mouse | Reproductive | Schroeder & Mitchener, 1971 |
| Cobalt | 1.2 | - | Rat | Reproductive | Domingo <i>et al.</i> , 1985 |
| | - | 20 | Rat | Reproductive | Mollenhauer <i>et al.</i> , 1985 |
| Copper | 2.67 | - | Mouse | Immunotoxicity | Pocino <i>et al.</i> , 1991 |
| | - | 632 | Mouse | Mortality, growth, water consumption | Hebert <i>et al.</i> , 1993 |
| DDT and Me- tabolites | 0.8 | 16 | Rat | Reproductive | USEPA (Great Lakes), 1995 |
| Heptachlor | 0.13 | - | Rat | Reproductive | Shain <i>et al.</i> , 1977 |
| | - | 6.8 | Rat | Developmental | Narotsky <i>et al.</i> , 1995 |
| Lead | 1.0 | - | Rat | Kidney | Fowler <i>et al.</i> , 1980 |
| | - | 241 | Mouse | Growth, liver, kidney | Wise, 1981 |
| Lindane | 0.05 | - | Rat | Reproductive | Naishtein & Leibovich, 1971 |
| | - | 3.75 | Mouse | Developmental | Sircar & Lahiri, 1989 |
| Manganese | 13.7 | - | Mouse | Reproductive | Gray & Laskey, 1980 |
| | - | 159 | Mouse | Reproductive | Gray & Laskey, 1980 |
| Mercury | 0.027 | 0.27 | Mink | Mortality, anorexia, neurological | USEPA (Great Lakes), 1995 |
| | 0.25 | - | Rat | Reproductive, develop- mental | USEPA (Great Lakes), 1995 |
| | - | 4.0 | Rat | Reproductive, develop- mental | USEPA (Great Lakes), 1995 |
| Methoxychlor | 2.5 | 50 | Rat | Reproductive | Gray <i>et al.</i> , 1989 |
| Naphthalene | 50 | - | Rat | Developmental | Navarro <i>et al.</i> , 1991 |
| | - | 150 | Rat | Developmental | Navarro <i>et al.</i> , 1991 |
| Nickel | 0.133 | 31.6 | Rat | Reproductive | Smith <i>et al.</i> , 1993 |
| PCBs | 0.36 | - | Mouse | Reproductive | Simmons & McKee, 1992 |
| | - | 1.28 | Mouse | Reproductive | Linzey, 1987 |
| Selenium | 0.05 | - | Mouse | Liver | Harr <i>et al.</i> , 1967 |
| | - | 1.21 | Mouse | Reproductive | Schroeder & Mitchener, 1971 |
| Thallium | 0.48 | 1.43 | Rat | Hair loss | Downs <i>et al.</i> , 1960 |
| Zinc | 9.60 | - | Mouse | Pancreas, adrenal cortex | Aughey <i>et al.</i> , 1977 |
| | - | 411 | Rat | Developmental | Schlicker & Cox, 1968 |

REFERENCES

- Aughey et al., 1977. The effects of oral zinc supplementation in the mouse. *Journal of Comparative Pathology*, 87:1-14.
- Brown et al., 1976. Intracellular effects of chronic arsenic administration on renal proximal tubule cells. *Journal of Toxicology and Environmental Health*, 1:505-514.
- Domingo et al., 1985. Effects of cobalt on postnatal development and late gestation in rats upon oral administration. *Revista Española de Fisiología*, 41:293-298.
- Downs et al., 1960. Acute and sub-acute toxicity studies of thallium compounds. *Industrial Hygiene Journal*, 21:399-406.
- Ema et al., 1995. Comparative developmental toxicity of butyltin trichloride, dibutyltin dichloride and tributyltin chloride in rats. *Journal of Applied Toxicology*, 15(4):297-302.
- Folwer et al. 1980. Chronic low-level lead toxicity in the rat. III. An integrated assessment of long-term toxicity with special reference to the kidney. *Toxicology and Applied Pharmacology*, 56(1):59-77.
- Gray & Laskey, 1980. Multivariate analysis of the effects of manganese on the reproductive physiology and behavior of the male house mouse. *Journal of Toxicology and Environmental Health*, 6:861-867.
- Gray et al., 1989. A dose-response analysis of methoxychlor-induced alterations of reproductive development and function in the rat. *Fundamentals of Applied Toxicology*, 12:92-108.
- Harr et al., 1967. Selenium toxicity in rats. International Symposium on Selenium in Biomedicine 1966 (Oregon State University). Editor: O. H. Muth. Westport, Conn., Avi Pub. Co. 445 p.
- Hebert et al., 1993. Subchronic toxicity of cupric sulfate administered in drinking water and feed to rats and mice. *Fundamental and Applied Toxicology*, 21 461-475.
- Linzey, 1987. Effects of chronic polychlorinated biphenyl exposure on reproductive success of white-footed mice (*Peromyscus leucopus*). *Archives of Environmental Contamination and Toxicology*, 16:455-460.
- Mollenhauer et al., 1985. Effects of dietary cobalt on testicular structure. *Virchows Archiv. B (Cell pathology including molecular pathology)*, 49:241-248.
- Naishtein & Leibovich, 1971. Effects of small doses of DDT and lindane and their mixture on sexual function and embryogenesis in rats. *Hygiene and sanitation*, 36:190-195.
- Navarro et al., 1991. Developmental toxicity evaluation of naphthalene (CAS NO. 91-20-3) administered by gavage to Sprague-Dawley (CD) rats on gestation days 6 through 15. Chemistry

and Life Sciences, Research Triangle Institute (RTI). Research Triangle Park, NC. RTI Master Protocol Number: RTI-376. December 5.

Neal & Rigdon, 1967. Gastic tumors in mice fed benzo(a)pyrene: a quantitative study. *Texas Reports on Biology and Medicine*, 13(4):553-557.

Narotsky et al., 1995. Non-additive developmental toxicity in mixtures of trichloroethylene, di-2-ethylhexyl phthalate, and heptachlor in a 5 x 5 x 5 design. *Fundamental and Applied Toxicology*, 27:203-216.

Paul et al., 1992. Effects of endosulfan and aldrin on muscle coordination and conditioned avoidance response in rats. *Pharmacology and Toxicology*, 71:254-257.

Pocino et al., 1991. Influence of the oral administration of excess copper on the immune response. *Fundamental and Applied Toxicology*, 16:249-246.

Schlicker & Cox, 1968. Maternal dietary zinc and development: Zinc, iron, and copper content of the rat fetus. *Journal of Nutrition*, 92:245-252.

Schroeder et al., 1968. Germanium, tin, and arsenic in rats: Effects on growth, survival, pathological lesions and life span. *Journal of Nutrition*, 96:37-45.

Schroeder & Mitchener, 1971. Toxic effects of trace elements on the reproduction of mice and rats. *Archives of Environmental Health*, 23:102-106.

Shain et al., 1977. The effect of chronic ingestion of selected pesticides upon rat ventral prostate homeostasis. *Toxicology and Applied Pharmacology*, 40:115-130.

Simmons & McKee, 1992. Alkoxyresorufin metabolism in white-footed mice at relevant environmental concentrations of Aroclor 1254. *Fundamental and Applied Toxicology*, 19:446-452.

Sircar & Lahiri, 1989. Lindane (gamma-HCH) causes reproductive failure and fetotoxicity in mice. *Toxicology*, 59:171-177.

Smialowicz et al., 1989. Immunotoxicity of tributyltin oxide in rats exposed as adults or pre-weanlings. *Toxicology*, 57:97-111.

Smith et al., 1993. Perinatal toxicity associated with nickel chloride exposure. *Environmental Research*, 61:200-211.

USEPA (Great Lakes), 1995. Great Lakes Water Quality initiative Criteria Documents for the Protection of Wildlife. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-820\b-95\008.

Webster, 1988. Chronic cadmium exposure during pregnancy in the mouse: Influence of exposure levels on the fetal and maternal uptake. *Journal of Toxicology and Environmental Health*, 74:183-192.

Wise, 1981. Protective action of calcium phytate against acute lead toxicity in mice. *Bulletin of Environmental Contamination and Toxicology*, 27:630-633.

**U.S. EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended
Toxicity Reference Values for Birds (Revision Date 11/21/2002)**

| Chemical | Low TRV mg/kg-day | High TRV mg/kg-day | Test Species | Toxic Endpoint(s) | Reference |
|---------------------|----------------------------------|-----------------------------------|-------------------------|---|--|
| Arsenic | 5.5 | 22.0 | Mallard | Reproductive | Stanley <i>et al.</i> , 1994 |
| Butyltins | 0.73 | 45.9 | Quail | Reproductive | Schlatterer <i>et al.</i> , 1993 |
| Cadmium | 0.08 - | - 10.4 | Mallard Mallard | Kidney Reproductive, multiple systemic effects | Cain <i>et al.</i> , 1983 Richardson <i>et al.</i> , 1974 |
| Copper | 2.3 - | - 52.3 | Chicken Chicken | Growth Growth, gizzard erosion | Norvell <i>et al.</i> , 1975 Jensen & Maurice, 1978 |
| DDT and Metabolites | 0.009 - | - 1.5 | Pelican Mallard | Reproductive Reproductive | USEPA (Great Lakes), 1995 USEPA (Great Lakes), 1995 |
| DDE | - | 0.6 | Mallard | Reproductive | USEPA (Great Lakes), 1995 |
| Lead | 0.014 - | - 8.75 | Quail Chicken | Reproductive Reproductive | Edens <i>et al.</i> , 1967 Edens & Garlich, 1983 |
| Manganese | 77.6 | 776 | Quail | Neurobehavioral | Laskey & Edens, 1985 |
| Mercury | 0.039 - | - 0.18 | Mallard Mallard | Reproductive Mortality, neurological | USEPA (Great Lakes), 1995 USEPA (Great Lakes), 1995 |
| Nickel | 1.38 - | - 56.3 | Mallard Mallard | Growth Growth | Cain & Pafford, 1981 Cain & Pafford, 1981 |
| PCBs | 0.09 - | - 1.27 | Chicken Chicken | Reproductive Reproductive | Platonow & Reinhart, 1973 Britton & Huston, 1973 |
| Selenium | 0.23 | 0.93 | Mallard | Reproductive | Heinz <i>et al.</i> , 1989 |
| Zinc | 17.2 | 172 | Mallard | Growth, reproductive, multiple organs | Gasaway & Buss, 1972 |

REFERENCES

- Britton & Huston, 1973. Influence of polychlorinated biphenyls in the laying hen. *Poultry Science*, 52:1620-1624.
- Cain & Pafford, 1981. Effects of dietary nickel on survival and growth of mallard ducklings. *Archives of Environmental Contamination and Toxicology*, 10: 737-745.
- Cain et al., 1983. Effects of dietary cadmium on mallard ducklings. *Environmental Research*, 32:286-297.
- Edens & Garlich, 1983. Lead-induced egg production decrease in leghorn and Japanese quail hens. *Poultry Science*, 62:1757-1763.
- Edens et al., 1967. Effect of dietary lead on reproductive performance in Japanese quail, *Coturnix coturnix japonica*. *Toxicology and Applied Pharmacology*, 38:307-314.
- Gasaway & Buss, 1972. Zinc toxicity in the mallard duck. *Journal of Wildlife Management*, 36(4):1107-1117.
- Heinz et al., 1989. Impaired reproduction of mallards fed an organic form of selenium. *Journal of Wildlife Management*, 53(2):418-428.
- Jensen & Maurice, 1978. Effect of Methionine on copper-induced growth depression and gizzard erosion, *Poultry Science*, 57:1530-1532.
- Laskey & Edens, 1985. Effects of chronic high-level manganese exposure on male behavior in the Japanese quail (*Coturnix coturnix japonica*). *Poultry Science*, 64:579-584.
- Norvell et al., 1975. Effects of Feeding High Levels of Various Copper Salts to Broiler Chickens. University of Missouri, Environmental Trace Substance Center and Extension Division. Proceedings of University of Missouri's 9th Annual Conference on Trace Substances in Environmental Health. Memorial Union, University of Missouri-Columbia, Columbia, Missouri. Pgs. 457-463.
- Platonow & Reinhart, 1973. The effect of polychlorinated biphenyls Aroclor 1254 on chicken egg production, fertility, and hatchability. *Canadian Journal of Comparative Medicine*, 37:341-346.
- Richardson et al., 1974. Dietary cadmium and enteropathy in the Japanese quail. *Laboratory Investigation*, 31(6):722-731.
- Schlatterer et al., 1993. Effects of bis(tri-n-butyltin) oxide in Japanese quail exposed during egg laying period: An interlaboratory comparison study. *Archives of Environmental Contamination and Toxicology*, 24:440-448.

Stanley et al., 1994. Main and interactive effects of arsenic and selenium on mallard reproduction and duckling growth and survival. *Archives of Environmental Contamination and Toxicology*, 26:444-451.

USEPA (Great Lakes), 1995. Great Lakes Water Quality initiative Criteria Documents for the Protection of Wildlife. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-820/b-95/008.